HERPETOLOGY.—*A new lizard of the genus* Leiocephalus *from Cuba (Squamata: Iguanidae).*

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Barbour (1937) list four species of the genus *Leiocephalus* from Cuba. One of these, *carinatus*, is represented in the Bahamas by a number of subspecies and the Cuban population is now divisible into two races subsequent to the description of *aquarius* by Schwartz and Ogren (1956). The form *carinatus virescens* of the Bahamas has recently been introduced in the United States in the vicinity of Miami, Florida (Carr and Goin, 1956). The remaining Cuban representatives of the genus (*cubensis*, *raviceps*, and *macropus*) are endemic species which until now have been considered monotypic.

A recent examination of *Leiocephalus macropus* Cope indicates that it is more variable than previously supposed and that the population occurring south of the Sierra Maestra Mountains is worthy of subspecific recognition. The new form is to be known as

Leiocephalus macropus immaculatus, n. subsp.

Holotype.—U.S.N.M. 138412 collected in the vicinity of Ocujal, Oriente Province, Cuba, between August 29 and 31, 1956.

Paratypes.—A total of 41 specimens as follows: U.S.N.M. 138378–86, Ocujal, vincinity of the town spring, August 28, 1956; U.S.N.M. 138387, 138405–11, 138413–17, Ocujal, August 29–31, 1956; U.S.N.M. 138388–98, from sea level to 800 feet on the south slope of Pico Turquino (near Ocujal), August 31, 1956; U.S.N.M. 138399–404, Ocujal, near the town spring, September 1, 1956[1]; U.S.N.M. 81680, Río Magdalena, 1930; M.C.Z. 42384, South of Pico Turquino.

Distribution.—All but one of the known specimens have come from the vicinity of Ocujal, Oriente Province, Cuba. The single exception is from Río Magdalena (Fig. 4).

Diagnosis.—Generally similar to *Leiocephalus macropus macropus* Cope, but differing in the following details: Generally a lack of union between the internasals and the anterior median prefrontal (Fig. 1); a higher frequency of specimens with one or two median prefrontals than with three or more; the absence in males of a well-defined black shoulder patch (Fig. 2); a moderate proportional difference in the head shape of males (Fig. 3); an over-all dorsolateral pattern of almost uniform light brown as opposed to the more metallic shades and variable pattern of *macropus macropus*.

Description of the holotype.—A male, U.S.N.M. 138412, having a snout-vent length of 75.1 mm. Head length (snout to the anterior margin of the ear) 17.8 mm. Width of head 13.8 mm. Head depth, 10.9 mm. Interorbital distance, 10.6 mm. Distance between the nostrils, 3.1 mm. Eye diameter, 3.4 mm. Length of fourth toe, 19.8 mm. The tail is broken with only 10.9 mm of its original length remaining. The fore limb, when appressed, reaches a point 2 mm anterior to the hind leg insertion; while the hind leg, appressed, reaches the middle of the eye.

Head scales enlarged, smooth anteriorly becoming strongly striated toward the back of the head. Nasals and internasals in contact with the

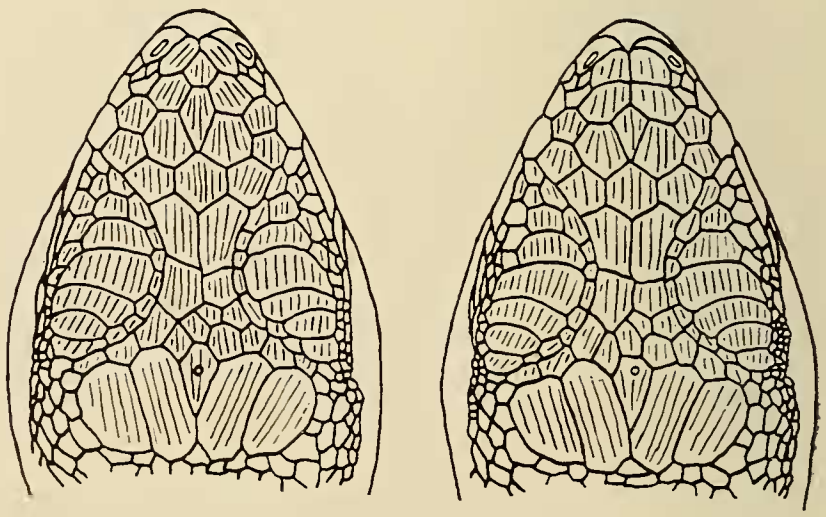

FIG. 1.—Typical head scales

[1] This much of the type series, including the holotype, was collected by the author and the following persons who accompanied him on a privately sponsored collecting trip during the summer of 1956: John E. Cooper and Clyde Prince, of the Natural History Society of Maryland; Anthony Picciolo, Department of Zoology, University of Maryland; and Donald Marlow of Alexandria, Va.

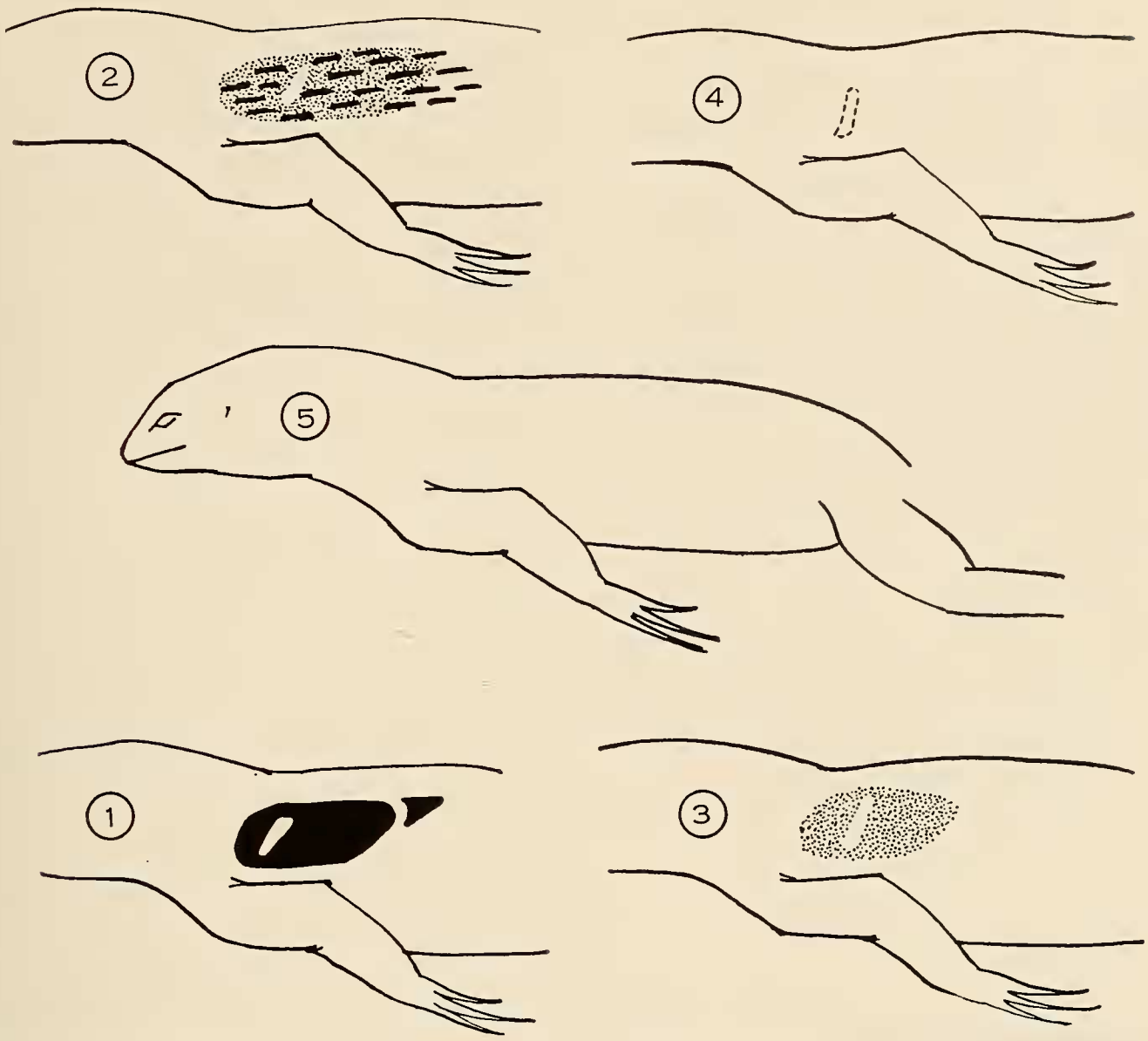

FIG. 2.—Diagrammatic illustration of the grading system used in studying differences in shoulder markings of male *Leiocephalus macropus*.

rostrum. Internasals oblique, broadly in contact with the nasals. Two median prefrontals, the anterior one kite-shaped, the second hexagonal and in contact with the frontals. Frontals much larger than the frontoparietals which are distinctly asymmetrical. Interparietal about equal to the anterior median prefrontal, bordered anteriorly by three small anomalous scales. Parietals in two pairs, the outermost broader than the inner. Circumorbitals 7/8; supraoculars 7/7. Upper labials 8/8, the third being somewhat longer than the rest. Infralabials 7/7, the second in contact medially with the second chin shield and the anterior-most sublabial. An extensive lateral nuchal pocket having a posterior skin fold which becomes continuous with the dorsolateral ridge. A well-developed lateral fold between the legs. Scales of the shoulder and neck region conspicuously small, but not granular, indistinctly keeled. Dorsal scales strongly keeled, ventrals smooth and much broader than long. Dorsal scale keels in longitudinal rows in the anterior dorsal region, but running obliquely on the posterior and lateral surfaces. Seventy-five scale rows encircle the body, and there are 63 scales along the middorsal line from the posterior margin of the parietals to a point approximately above the anterior lip of the anus. Subdigital lamellae of the fourth toes, 27/29.

The color notes refer to the specimen after one year in preservation. Ventrally uniform bluish white except beneath the hind limbs and tail, which have a faint brownish hue. Laterally a broad band of dark brown about 14 scales in width. This band is darkest in the region of the neck and on the sides of the head. Dorsally there is a well defined broad band of light greenish brown mottled faintly with lighter brown. The raised middorsal scales are somewhat darker than the scales immediately adjacent to them. The head scales are light brown; but many of them have been lost thus giving the top of the head a grayish appearance. A small vertically oriented white bar occurs over the insertion of the right arm, but is missing on the left side. A similar white mark, more or less horizontally oriented, is located on the posterior margin of each thigh at a point approximately one fourth of the way from the base of the tail to the knee.

Variations in the paratypes.—The snout-vent length of mature specimens ranges from 44.6 to 83.3 mm. Females range from 44.6 to 65.2 mm

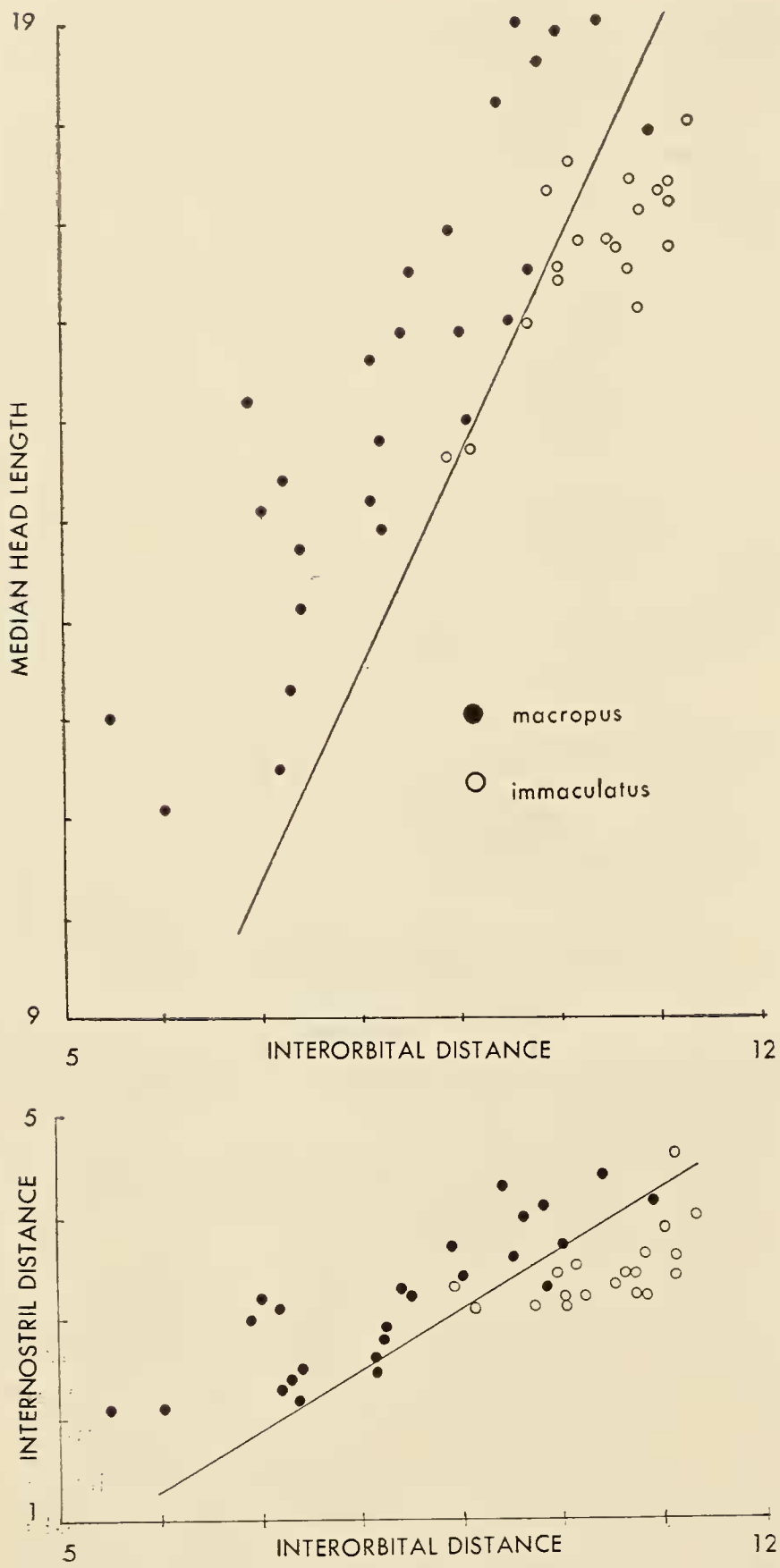

FIG. 3.—Graphic representation of head measurements of the two races of *Leiocephalus macropus* showing proportional differences in the males.

with a mean of 58.8; which the males range from 63.6 to 80.3 with a mean of 73.7 mm.

The number of subdigital lamellae of the fourth toe ranges from 27 to 32 in males with a mean of 28.7; in females the mean is 28.2 with a range of 23 to 30. The number of median dorsal scales varies in males from 58 to 71 (M 63.7) and in females from 59 to 68 (M 63.6).

The males are uniform brown dorsally, generally without, but occasionally with an ill-defined black shoulder patch. There is generally a faint middorsal brown spot or cross bar in the sacral and pectoral region. The throats and chins of adults are white or bluish; but young specimens tend to have them strongly mottled with gray. Occasional individuals have the chin very light blue, flecked with ivory. The females are more variable than the males in color and pattern, the dorsolateral color ranging from light brown to grey, frequently with much light cross mottling. The chins of females are usually more mottled with grey than are those of the males. All color notes refer to material which has been preserved for one year.

Comparisons.—The series of *immaculatus* has been compared to 45 specimens of *macropus macropus* in the collections of the United States National Museum and Museum of Comparative Zoology.

The two forms are most readily distinguished by the presence or absence of a dark shoulder patch. This is a sexually dichromatic character strongly developed in males and occurring only rarely as a poorly defined mottling in females. A grading system for various modifications of the shoulder patch was devised (Fig. 2) and male specimens classified accordingly.

Class	1	2	3	4	5	No.
immaculatus		1	5	15	2	23
macropus	20	8	2			30

If a separation is made between classes 2 and 3, 96 per cent of the *immaculatus* population falls between classes 3 and 4, while only 7 per cent of the *macropus* population is within this range.

The use of head scales as a taxonomic character in *Leiocephalus* is complicated by their frequently anomalous arrangement. The accompanying diagram (Fig. 1) shows normal head scale arrangements for the two subspecies. Only the median scales anterior to the frontals have been counted and these are collectively referred to as the median prefrontals, although some workers might consider the anterior one the frontonasal, and the posterior one, in some cases, might actually be a fragment of one of the frontals.

The degree of variation in head scales is of about equal magnitude in both sexes, so that data for males and females have been combined. Two head scale arrangements are recognizable; in the first the internasals are touched, thus slightly or completely separated by the anterior median prefrontal; in the other the internasals and the anterior median prefrontals are

not in contact. The first condition is referred to as internasal type A; the second as internasal type B. The two forms can be separated as below on the basis of this character.

	Type A	Type B
immaculatus	81%	19%
macropus	12%	88%

The number of median prefrontals varies considerable, but there is an observable shift from *macropus* to *immaculatus*.

Prefrontals	1	2	3	4	5	No.	Mean
immaculatus	1	25	15	2		43	2.4
macropus		5	33	2	2	42	3.1

Although the means are close it is possible to demonstrate an apparent difference between the populations based on this character through the employment of the method of Ginsburg (1938) for the separation of subspecies.

Prefrontals	1	2	3	4	5
immaculatus	.023	.581	.348	.046	.000
macropus	.000	.119	.786	.048	.048
Least overlap	.000	.199	.348	.046	.000

The raw data have been converted to percentage figures and the percentage of least overlap noted for each unit. When these percentages are summed and divided by two, the resultant figure represents the average intergradation between the two populations. This figure is 0.256 and falls very close to Ginsburg's percentage limit for subspecies (25 percent).

Intrasubspecific variations in the arrangement and number of anterior head scales occur frequently in both *macropus* and *immaculatus*, but these tend to follow basically recognizable patterns (Fig. 5). Note the intergradation represented in parts D, K, and L of this figure.

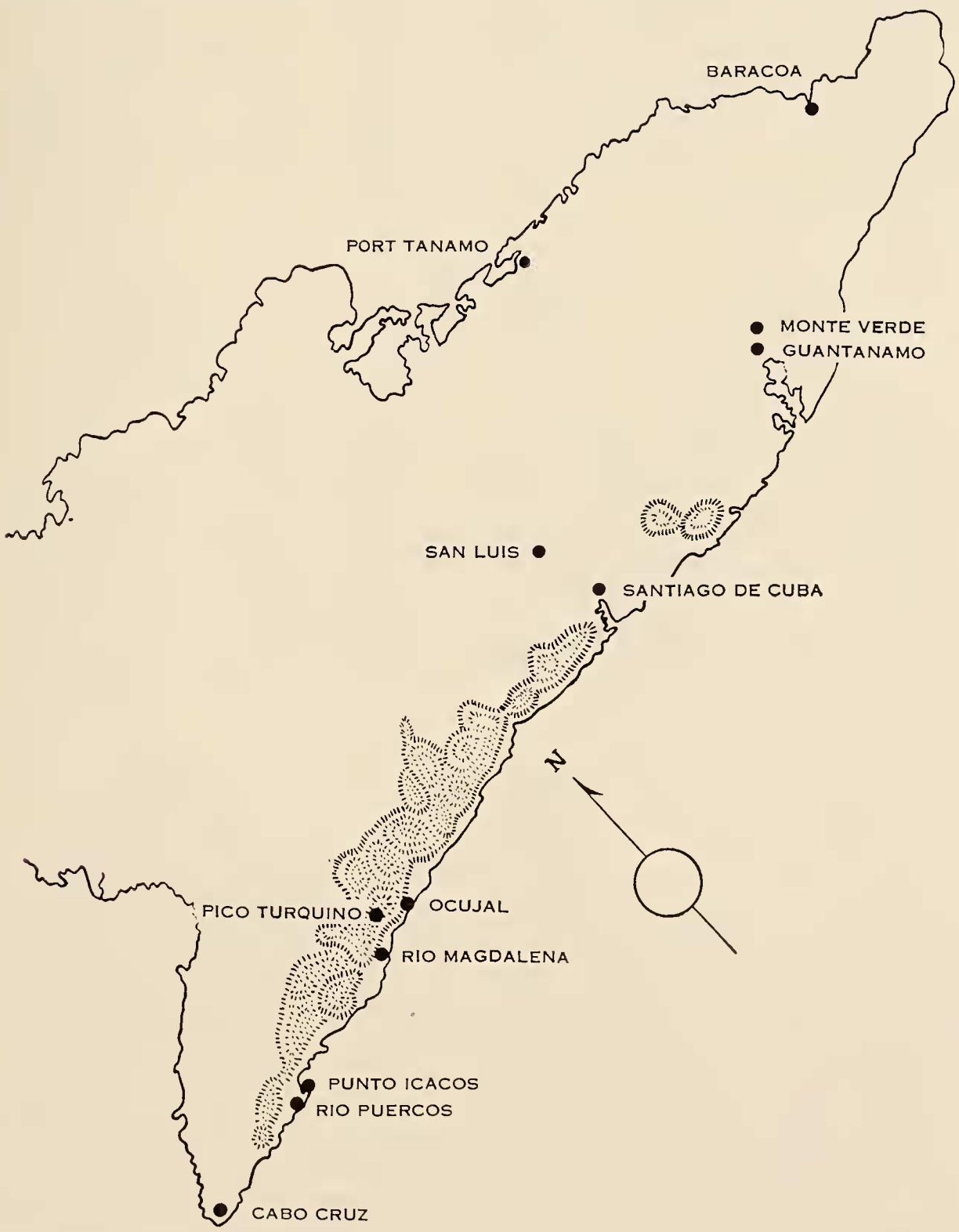

FIG. 4.—Map of Oriente Province, Cuba, showing localities mentioned in the text plus the Sierra Maestra Mountains south of which *Leiocephals macropus immaculatus* occurs.

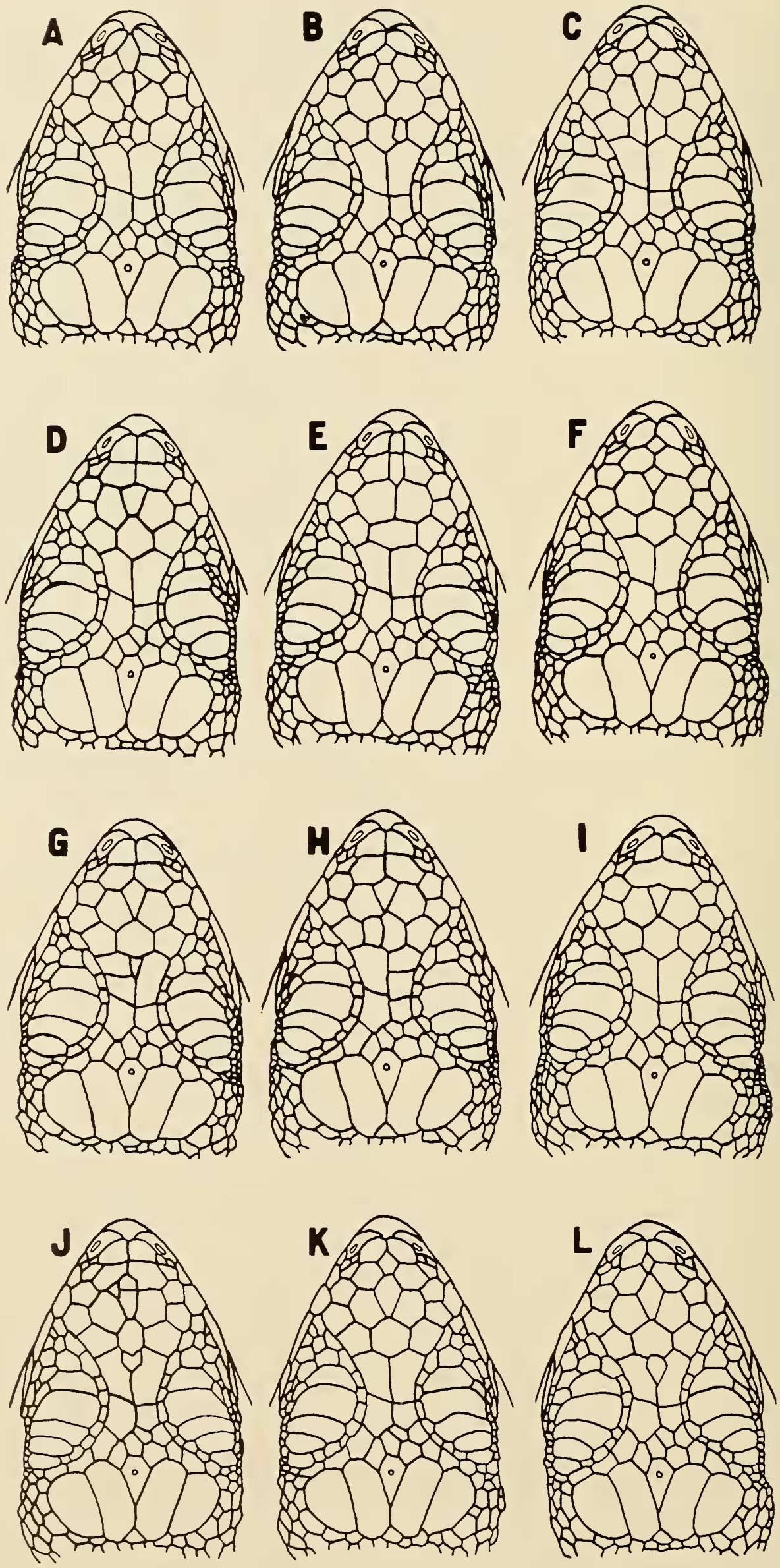

Fig. 5.—Characteristic variations in the head scales of *Leiocephalus macropus*. A–F, *macropus macropus*. G–L, *macropus immaculatus*. (The basic scale diagram was taken from Barbour and Ramsden, 1919, pl. 10, fig. 5.)

A series of measurements was made, three of which tended to indicate proportional differences in the head shape of males of the two forms. The data for these measurements have been plotted on scatter graphs and a line drawn in each case that would give maximum separation of the subspecies (Fig. 3). The percentages thus established are as follows:

	Above	Below
macropus	85%	15%
immaculatus	11%	89%

Internostril/Interorbital distance

	Above	Below
macropus	94%	4%
immaculatus	16%	84%

Median head length/Interorbital distance

No distinct proportional differences are observable in the females as indicated by the same data plotted for female samples.

Cochran (1941) points out that the chin and throat patterns of *Leiocephalus* are excellent characters for separating the numerous subspecies of *persontaus* occurring on Hispaniola. Although these characters are generally useful throughout the genus, they are of no diagnostic value in the present species since they are subject to both ontogenetic change and regional variation.

The type series of Leiocephalus macropus macropus *Cope.*—The 11 cotypes of *Leiocephalus macropus macropus* in the collection of the United States National Museum have not been included in the foregoing discussion owing to uncertainty as to the exact type locality. Cope (1862) in his original description of *macropus* gave the type locality simply as "Eastern Cuba."

Stejneger (1917) restricted this to Monte Verde on the basis of an old label in the jar with the cotypes. This label is no longer available. There is, however, a Monte Verde shown on the Military Map of Cuba for 1906, situated approximately 17 miles northeast of Guantánamo. It is reasonable to assume that this is the correct type locality, but there will always be some doubt.

U.S.N.M. 25819 best fits the measurements given by Cope (loc. cit.) and is, therefore, designated as a lectotype of the subspecies *macropus macropus*.

The cotypes in the U.S.N.M. agree with *Leiocephalus macropus macropus* as herein defined. Two of the specimens are males and have well-defined shoulder patches. Data for the other differentiating characteristics are as follows:

No.	Sex	Internasal Type	No. Prefrontals
12254A	♂	B	3
12254B	♀	B	3
12254C	♀	B	4
12254D	♀	B	3
25812	♀	B	3
24826	♀	A	1
25820	♀	B	3
25919	♂	B	3
25822	♀	B	3
25823	♀	B	3
25825	♀	B	3

The single cotype in the collection of the Museum of Compatative Zoology has not been examined.

Specimens examined.—Specimens used in this study include the type material of *macropus* and *immaculatus* as listed plus the following specimens of *macropus macropus*: U.S.N.M. 26769, Santiago de Cuba, C. W. Richmond, April 24, 1900; U.S.N.M. 29793, San Luis, W. Palmer, February 16, 1902; U.S.N.M. 29795, Baracoa, W. Palmer, January 30, 1902; U.S.N.M. 29847, Baracoa, W. Palmer, 1902; U.S.N.M. 59156–7, –60–61, Guantánamo Bay, Henderson and Bartsch, not dated; U.S.N.M. 80402–4, Port Tanamo, Parish-Smithsonian Expedition, 1930; U.S.N.M. 81671–2, 81674, Río Puerco, Paul Bartsch, 1930; U.S.N.M. 81681–4, Punto Icacos, Paul Bartsch, 1930; U.S.N.M. 81688–9. Cabo Cruz, Paul Bartsch; U.S.N.M. 138423, –25–30, Cabo Cruz, J. D. Hardy, Jr., September 5, 1956; M.C.Z. 11208, 11214, 12067–70, 14020–22, Baracoa; M.C.Z. 11436–38, Guantánamo; M.C.Z. 11435, Cabo Cruz; M.C.Z. 6922 (two specimens) Santiago de Cuba; M.C.Z. 47048–9, Baracoa (Joar); M.Z.C. 42518, El Junque de Baracoa.

Discussion.—The difficulties inherent in employing trinomial nomenclature to local populations are, at present, quite great due to the almost universally realized subjectivity of the subspecies concept and the complete lack of any real standards. At least three circumstances occur in the Cuban herpetofauna which result in apparently distinct populations within the same species. The first of these is the simple cline. Such a cline has been pointed out by Cochran (1941) who demonstrates a gradual increase from east to west in the number of ventrals in

the snake *Typhlops lumbricalis*. Likewise, it is becoming increasingly obvious that the two named subspecies of *Alsophis angulifer* represent such a cline with no distinct breaks clearly in evidence. The second circumstance involves highly variable species in which local populations seem unique. Thus several "new species" of *Hyla* have been named from Cuba all of which are currently in the synonomy of the quite variable *Hyla septentrionalis*. The third condition, and certainly the one to which a trinomial can most validly be applied, involves a number of quantitative and/or qualitative differences all of which break along approximately the same line in the species range, and in which a definite physiographic or environmental barrier can be correlated with the line of intergradation.

The last situation seems applicable to the population of *Leiocephalus macropus immaculatus*. The coastal area south of the Sierra Maestra Mountains is exceeding narrow and low and has been completely inundated by the sea within comparatively recent geological times. The flooding was apparently sufficient to make islands of the high mountain peaks and cause isolation of formerly continuous, homogeneous populations. Presumably these populations diverged slightly and with continued isolation may have evolved into full species; but with the receding of the sea they re-invaded the coastal region and various degrees of gene exchange with adjacent populations have since been possible.

The *immaculatus* population has remained relatively stable as a result of its habitat preference and limited vertical distribution. Thus far it has been taken only as high as 800 feet in the mountains, and probably does not occur much higher. Its habitat includes relatively open forest, meadow lands and the sandy *Coccoloba* forests just back of the beaches. The numerous rivers, some of them semi-torrential, which flow across the costal region, coupled with the dense vegetation along their banks, probably are important limiting factors in gene exchange between *immaculatus* and *macropus*. *Leiocephalus* is completely lacking along these river gorges and is replaced in abundance by various anoles, especially *Anolis argenteolus*. Allee et al. (1950) suggest that populations of animals surmount river barriers by invading their headwaters, thus going around the river. Since the habitat of *immaculatus* is limited to the lower slopes of the mountains, this course seems improbable, and the subspecies is at present relatively isolated.

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